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(56) Documents Cited

GB 1044027 A EP 0453200 A2 EP 0337195 A2

(58) Field of Search

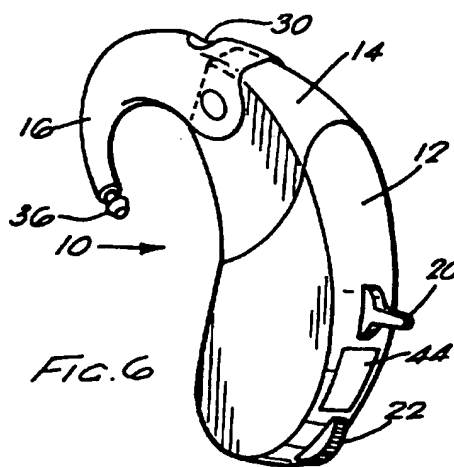
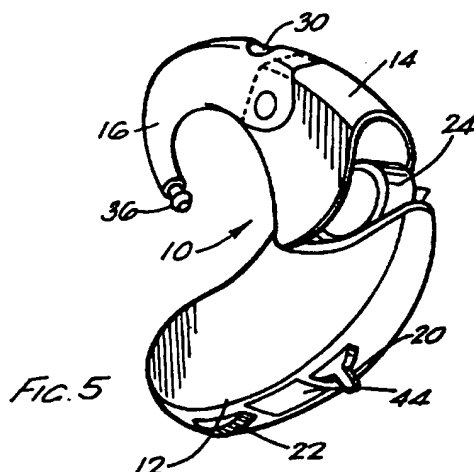
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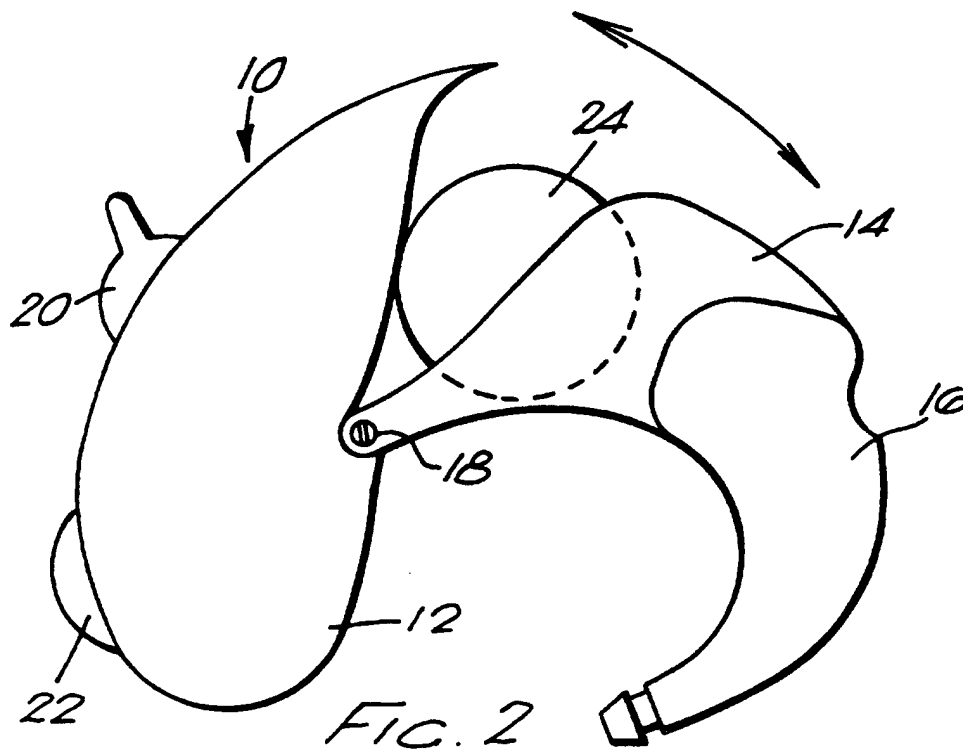
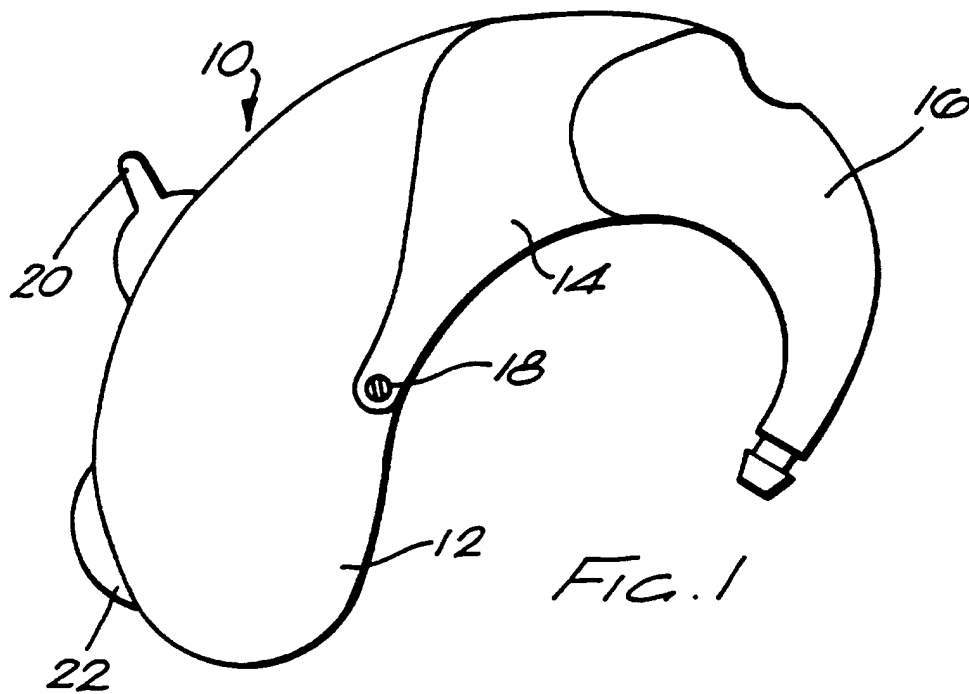
ONLINE: WPI, JAPIO, CLAIMS

(54) Hearing aid having hinged housing

(57) A behind-the-ear hearing aid has an external shell comprising two sections 12, 14 hinged together so as to be movable between an open position and a closed position, one section 12 including the amplifier and the other section 14 including the microphone and/or the speaker. Such a hearing aid can be assembled in two discrete portions which are only brought together at the final stage of assembly. This allows the amplifier electronics and the microphone electronics to be assembled and tested separately, thus speeding final assembly. In preferred embodiments, when the shell is in the open position, the battery 24 is accessible for replacement. This obviates the need for a separate flap to provide access to the battery. With the battery positioned in the middle of the volume inside the shell a degree of electrical isolation is provided which reduces the possibility of interference.



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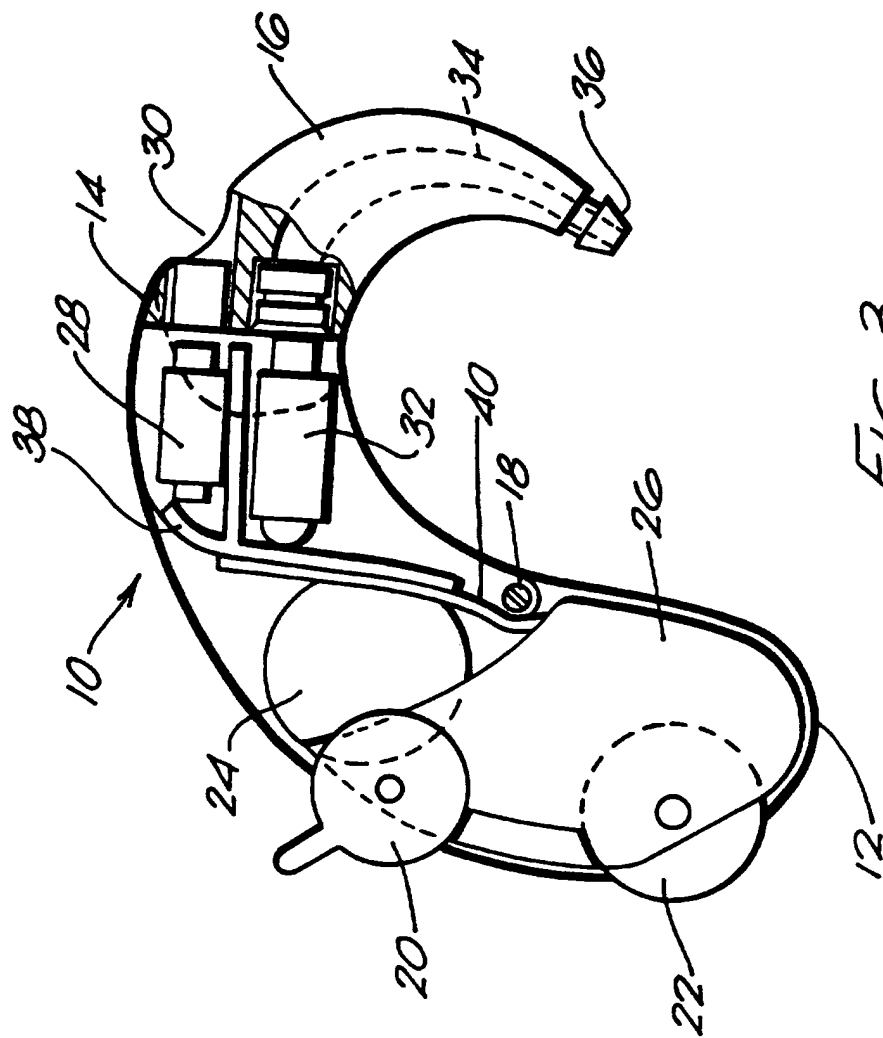
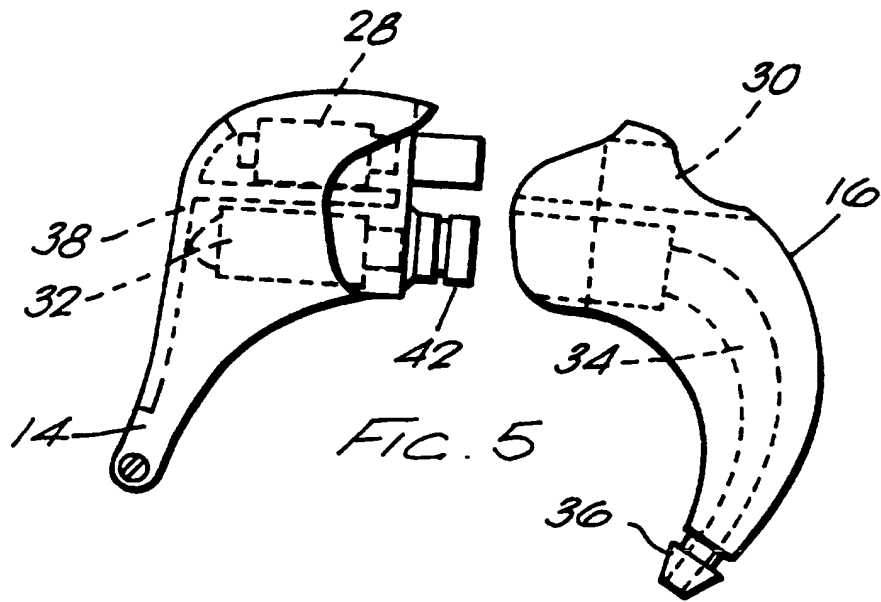
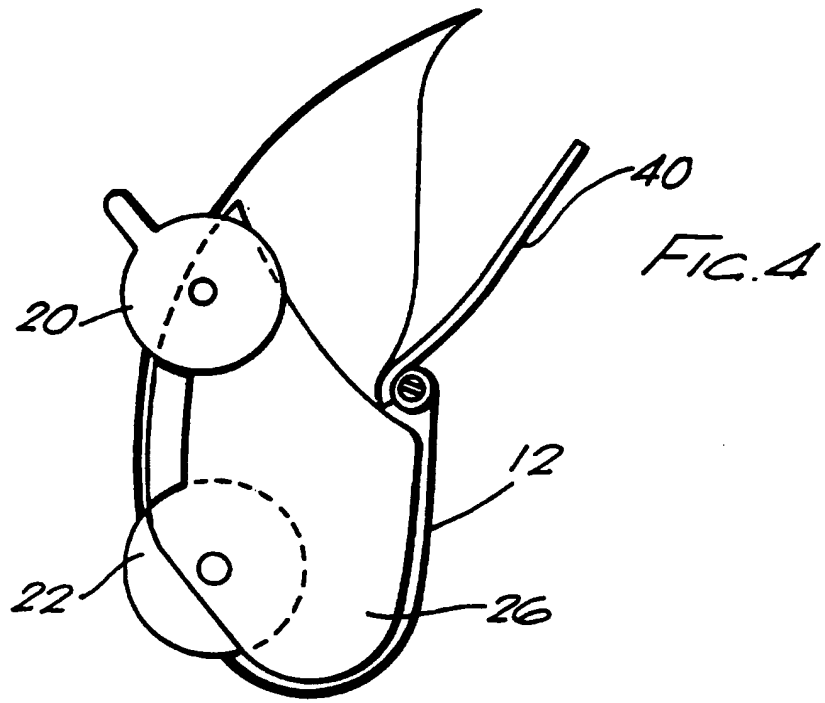
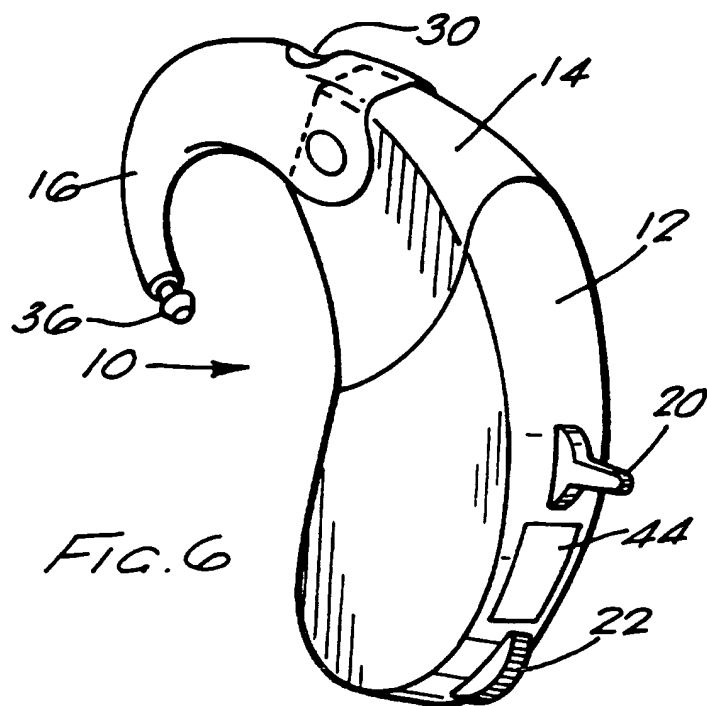
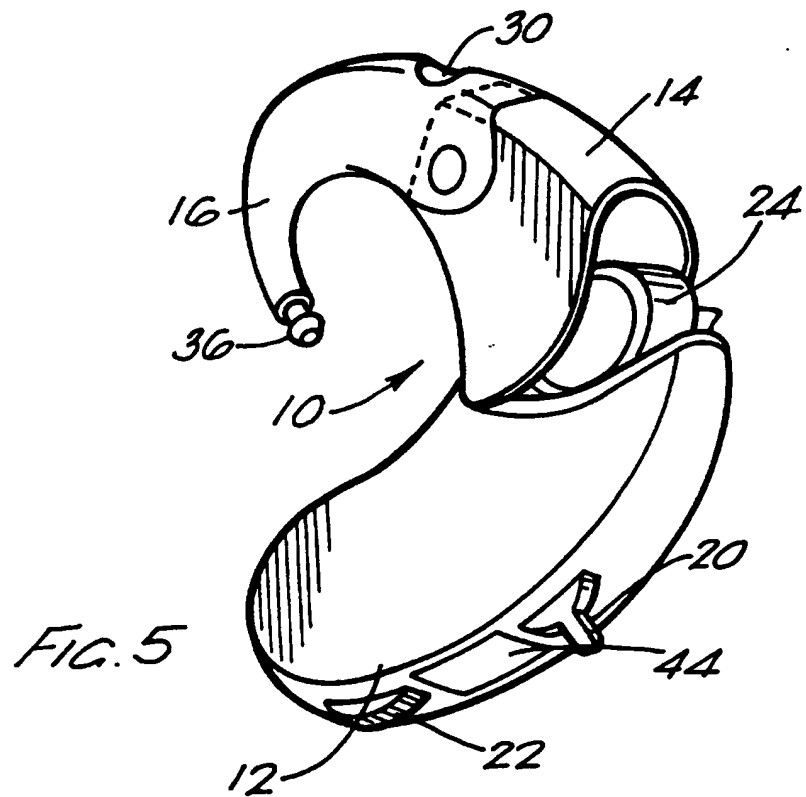


FIG. 3.

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HEARING AID

The present invention relates to a hearing aid.

There are three known types of hearing aid. First, there is the original type in which a pocket-sized shell contains all the necessary transducers and electronics and has a small earpiece connected thereto. The aid is placed in (e.g.) a breast pocket where it is well placed to pick up ambient sound. Although this type is simple and cheap to make, it is very obtrusive and hence cosmetically less preferred.

The second type, much smaller than the first, is a "behind-the-ear" (BTE) hearing aid. This is a small, elongate, slightly curved shell that lodges behind the ear and contains all the necessary electronics. A small port is provided to which can be attached a moulded sound pipe which directs amplified sound to the ear canal. This hearing aid will contain the microphone, amplifier, battery and speaker within the shell, whose general shape and internal distribution of components has been almost identical for approximately ten to fifteen years. The shell may have a flap which can be lifted to expose the battery, to allow replacement. Sometimes, the flap includes a holder extending from an internal face thereof which holds the

battery; hence whilst the flap is closed the battery is held in place between contacts, whilst opening of the flap neatly removes the battery.

The third, and it is believed final, form of hearing aid is the "in-the-ear" type (ITE). This is a significantly smaller device which locates entirely within the ear canal. The internal electronics is of necessity significantly smaller and therefore more expensive, although less amplification needs to be provided since the speaker is physically closer to the ear-drum.

The present invention provides a behind-the-ear hearing aid having an external shell, a microphone, an amplifier, a battery and a speaker, wherein the shell comprises two sections hinged together so as to be movable between an open position and a closed position, one section including the amplifier and the other section including the microphone and/or the speaker.

Such a hearing aid can be assembled in two discrete portions which are only brought together at the final stage of assembly. It is normal for the amplifier electronics and the transducer electronics (which expression includes the microphone and the speaker) to be assembled separately and tested separately, and only brought together at the final stage. In the prior art, the shell then needed to be assembled around the parts. The present invention allows the two parts to be assembled with shell and tested

separately; hence the final assembly stage is significantly faster without incurring significant penalties earlier in the procedure.

Preferably, the shell is elongate, with the hinge-line being transverse to the elongate axis. This provides a neat and handy division. Alternatively, or in addition, the shell is preferably curved so as to conform to the rear of an ear, the hinge-line being transverse to the radius of curvature. This is a similarly convenient arrangement.

It is particularly preferred if, when the shell is in the open position, the battery is accessible for replacement. This obviates the need for a separate flap to provide access to the battery. Preferably, when the shell is closed, the battery is positioned between contacts in such a manner that opening of the shell leaves the battery between the portions, but not firmly attached to either. Hence, it can be easily removed. This can be contrasted with known BTE hearing aids in which a small flap must be opened and the battery removed from a close-fitting recess in or behind the flap. Since many hearing aid users are elderly, this is a significant improvement.

A further advantage available in this preferred form of the invention is that the battery is then positioned in the middle of the volume inside the shell. Hence, it is provided between the amplifier and the microphone/speaker. This provides a degree of electrical isolation between

those parts which reduces the possibility of interference.

Thus, preferred embodiments of the present invention provide a hearing aid with improved end-user manageability, with respect to the battery changes which are necessary in the life of an aid. It is also easier to manufacture, and hence less expensive, without necessarily incurring attendant cosmetic disadvantages.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying Figures, in which;

Figure 1 is a plan view of the hearing aid according to the present invention, in the closed position;

Figure 2 is a plan view of the hearing aid of Figure 1 but in the open position;

Figure 3 is a sectional plan view of the hearing aid of Figure 1 showing the internal arrangement of parts;

Figure 4 is a sectional plan view of the amplifier sub-assembly;

Figure 5 is an exploded part sectional plan view of the transducer sub-assembly; and

Figures 6 and 7 are isometric views of the hearing aid of Figure 1 in the open and closed positions respectively.

Figure 1 shows the hearing aid 10 of the present invention. The exterior shell of the hearing aid 10 is formed of three main interconnected parts, the first shell portion 12, a second shell portion 14, and a sound conduit 16. The sound conduit 16 and second shell portion 14 are firmly fitted together by a snap-fit arrangement at their join. The first and second shell portions 12 and 14 are hinged together by a hinge 18.

The general external shape of the three main parts 12 to 16 is that of a conventional behind-the-ear hearing aid. However, the join between the first and second shell portions is generally transverse to the length of the aid and this therefore allows the hearing aid to divide into two main parts when opened.

Also shown in Figure 1 are the on-off switch 20 and a volume knob 22.

Figure 2 shows the hearing aid 10 in the open position. As can be seen, the second shell portion 14 and conduit 16 remain attached, whilst the first and second shell portions rotate about the hinge 18. Once the hearing aid 10 is opened, the battery 24 is exposed within the casing. It can easily be removed and replaced by the user. The battery 24 is held,

when the hearing aid 10 is open, by seating in a suitably shaped recess in the second shell portion 14; closing the hearing aid causes it to be pushed between contacts in the first shell portion 12.

Figure 3 shows the internal arrangement of parts within the hearing aid 10. Within the first shell portion 12 is an amplifier unit 26 which is powered by the battery 24. The amplifier unit 26 includes the volume control 22 and on/off switch 20. The circuitry used in the amplifier 26 may be conventional.

Within the second shell portion 14 is a microphone 28 which communicates with an opening 30 in the conduit 16. Also within the second shell portion 14 is a speaker 32 which communicates with an internal passage 34 within the conduit 16 which in turn leads to a nipple connection 36 at the tip of the conduit portion 16. In use, an in-ear moulding is clipped to the nipple 36, thereby to direct sound from the speaker 32 via the passage 34 directly into the ear canal.

Within the second shell portion 14 is an internal wall 38 which serves to delineate the volumes occupied by the microphone 28 and speaker 32. This goes some way to preventing feedback within the aid 10.

Electrical connection needs to be made between the microphone 28, speaker 32 and amplifier unit 26. This is by way of a flexible printed

circuit board (PCB) 40 which extends from within the amplifier unit 26, across the hinge-line 18 to within the second shell portion 14 where it can be connected to the microphone 28 and speaker 32.

Figures 4 and 5 show the respective first and second parts of the aid 10. Like parts are denoted by like reference numerals.

It will be seen from Figure 4 that the first shell unit 12 contains the amplifier 26 and attendant on/off switch 20 and volume knob 22. Extending from within the first shell portion 12 is the flexible PCB 40. Thus, this sub-assembly can be produced and tested independently.

Figure 5 shows the transducer sub-assembly formed within the second shell portion 14. As depicted, the conduit portion 16 is ready for snap-attachment to the second shell portion 14. The microphone 28 within the shell portion 14 extends into a space 30 within conduit portion 16 which is open to the outside world. Thus, external sounds can be picked up. The speaker 32 communicates with the internal passage 34 of the conduit portion 16 which, as described previously, leads to the connection nipple 36. At the join 42 between the speaker 32 and the internal passage 34, provision is made for an O-ring seal.

As previously mentioned, an internal plastics wall 38 is provided, sealable to the interior faces of the shell portion 14. This reduces the

opportunity for feedback.

Electrical connections for the microphone 28 and speaker 32 are brought through the wall 38 into position where they can be easily connected to the flexible PCB 40 as the final step of assembly.

Figures 6 and 7 show, for illustrative purposes, the hearing aid 10 of the present invention in the open and closed positions respectively. It can be seen that in the open position, the battery 24 is easily accessible for replacement.

Also visible on Figures 6 and 7 is an access flap 44 which snaps closed but can easily be opened in a known fashion to provide access to preset potentiometer-based controls for altering the electrical characteristics of the amplifier 26 as required.

It will be appreciated that the above described embodiment is purely illustrative of the present invention, and that many variations could be made without departing from the scope of this invention. For example, the precise external shape of the aid is dictated more by the need to fit behind an ear than by the invention. Equally, the precise circuitry and components used can be varied.

CLAIMS

1. A behind-the-ear hearing aid having an external shell, a microphone, an amplifier, a battery and a speaker, characterised in that the shell comprises two sections hinged together so as to be movable between an open position and a closed position, one section including the amplifier and the other section including the microphone and/or the speaker.
2. A hearing aid according to claim 1 wherein the shell is elongate, with the hinge-line being transverse to the elongate axis.
3. A hearing aid according to claim 1 or claim 2 wherein the shell is curved so as to conform to the rear of an ear, the hinge-line being transverse to the radius of curvature.
4. A hearing aid according to any preceding claim wherein the battery is accessible for replacement when the shell is in the open position.
5. A hearing aid according to any preceding claim wherein when the shell is closed, the battery is positioned between contacts such that opening of the shell leaves the battery between the portions, but not

firmly attached to either.

- 6. A hearing aid according to any preceding claim wherein the battery is positioned between the amplifier and the microphone/speaker when the shell is closed.**
- 7. A hearing aid substantially as herein described with reference to and/or as illustrated in the accompanying drawings.**



Application No: GB 9618183.9
Claims searched: 1 to 6

Examiner: Peter Easterfield
Date of search: 1 November 1996

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H4J (JAAA, JH)

Int Cl (Ed.6): H04R 25/00, 25/02

Other: Online: WPI, JAPIO, CLAIMS

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 1044027 A (AMPLIVOX)	
A	EP 0453200 A2 (UNITRON)	
A	EP 0337195 A2 ((SIEMENS)	

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
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